# 03-R-312, Center For Nanophase Materials Sciences
# Oak Ridge National Laboratory, Oak Ridge, Tennessee

(Changes from FY 2004 Congressional Budget Request are denoted with a vertical line in the left margin.)

## 1. Construction Schedule History

| | Fiscal Quarter | | | | Total Estimated Cost ($000) | Total Project Cost ($000) |
|---|---|---|---|---|---|---|
| | A-E Work Initiated | A-E Work Completed | Physical Construction Start | Physical Construction Complete | | |
| FY 2003 Budget Request *(Preliminary Estimate)* | 2Q2002 | 1Q2003 | 3Q2003 | 4Q2006 | 64,000 | 65,000 |
| FY 2004 Budget Request | 2Q2002 | 1Q2003 | 3Q2003 | 4Q2006 | 64,000 | 65,000 |
| FY 2005 Budget Request *(Current Estimate)* | 2Q2002 | 1Q2003 | 3Q2003 | 4Q2006 | 63,882[a] | 64,882[a] |

## 2. Financial Schedule

(dollars in thousands)

| Fiscal Year | Appropriations | Obligations | Costs |
|---|---|---|---|
| Project Engineering & Design (PED) | | | |
| 2002 | 1,500 | 1,500 | 1,342 |
| 2003 | 988[b] | 988[b] | 1,121 |
| 2004 | 0 | 0 | 25 |
| Construction | | | |
| 2003 | 23,701[b] | 23,701[b] | 1,160 |
| 2004 | 19,882[b] | 19,882[b] | 18,267 |
| 2005 | 17,811 | 17,811 | 19,215 |
| 2006 | 0 | 0 | 22,752 |

[a] The TEC and TPC are reduced by $118,000 due to the FY 2004 Rescission.

[b] PED and construction funding were reduced by $12,000 and $299,062, respectively, as a result of the FY 2003 general reduction and rescission and by $118,000 as result of the FY 2004 rescission.

## 3. Project Description, Justification and Scope

This proposed Center for Nanophase Materials Sciences (CNMS) will establish a nanoscale science research center at Oak Ridge National Laboratory (ORNL) that will integrate nanoscale science research with neutron science, synthesis science, and theory/modeling/simulation of nanophase materials. The total gross area of the new building will be approximately 80,000 square feet, providing state-of-the-art clean rooms, and general laboratories for sample preparation, fabrication and analysis. Included will be initial equipment for nanoscale materials research such as surface analysis equipment, nanofabrication facilities, etc. The facility, co-located with the Spallation Neutron Source complex, will house ORNL staff members and visiting scientists from academia and industry. There are no existing buildings at ORNL that could serve these needs.

The CNMS's major scientific thrusts will be in nano-dimensioned soft materials, complex nanophase materials systems, and the crosscutting areas of interfaces and reduced dimensionality that become scientifically critical on the nanoscale. A major focus of the CNMS will be to exploit ORNL's unique facilities and capabilities in neutron scattering to determine the structure of nanomaterials, to develop a detailed understanding of synthesis and self-assembly processes in "soft" materials, and to study and understand collective (cooperative) phenomena that emerge on the nanoscale. Neutron scattering provides unique information (complementary to that provided by other methods) about both the atomic-scale structure and the dynamics of a wide variety of condensed matter systems including polymers, macromolecular systems, magnetic and superconducting materials, and chemically complex materials, particularly oxides and hydrogen-containing structures. The intense neutron beams available at the upgraded High Flux Isotope Reactor and the new Spallation Neutron Source will make broad classes of related nanoscale phenomena accessible to fundamental study.

Since the late 1980s, there has been a recognized need to enhance U.S. capabilities in the synthesis of materials. These concerns are exacerbated by the challenges of controlled synthesis of nanophase materials. There is currently a critical, unmet national need for the synthesis of high quality nanophase research materials. It is also recognized that the existence of capabilities for science-driven synthesis of novel materials has played a central role in some of the most spectacular recent discoveries of new phenomena, including high-temperature superconductivity, the quantum and fractional quantum Hall effects, conducting polymers, and colossal magnetoresistance. Therefore, synthesis and characterization of nanophase materials (including copolymers and macromolecular systems, multilayered nanostructures, ceramics, composites, and alloys with nanoscale spatial charge and/or magnetic ordering) will be an essential component of the CNMS. With these capabilities the CNMS will become a national resource for nanophase materials for use by researchers across the nation.

The CNMS project scope includes preliminary and final design, as well as procurement of an initial set of experimental capital equipment and construction of facilities. PED funding was allocated in FY 2002 and FY 2003 to complete design of the CNMS. FY 2003 construction funding was used to initiate construction and equipment procurement. FY 2004 and FY 2005 funding will be used to continue funding the conventional construction and equipment procurement.

## 4. Details of Cost Estimate[a]

(dollars in thousands)

| | Current Estimate | Previous Estimate |
|---|---|---|
| Design Phase | | |
| Preliminary and Final Design Costs | 2,067 | 1,700 |
| Design Management Costs (0.6% of TEC) | 366 | 200 |
| Project Management Costs (0.1% of TEC) | 55 | 100 |
| Total, Design Costs | 2,488 | 2,000 |
| Construction Phase | | |
| Improvements to Land | 125 | 500 |
| Buildings | 27,269 | 19,700 |
| Special Equipment[b] | 21,149 | 26,000 |
| Utilities | 500 | 500 |
| Inspection, design and project liaison, testing, checkout and Acceptance | 1,638 | 1,800 |
| Construction Management (2.8% of TEC) | 1,800 | 900 |
| Project Management (1.7% of TEC) | 1,100 | 800 |
| Total, Construction Costs | 53,581 | 50,200 |
| Contingencies | | |
| Design Phase (0% of TEC) | 0 | 500 |
| Construction Phase (12.2% of TEC) | 7,813 | 11,300 |
| Total, Contingencies (12.2% of TEC) | 7,813 | 11,800 |
| Total, Line Item Costs (TEC) | 63,882 | 64,000 |

## 5. Method of Performance

Design will be performed by an architect-engineer utilizing a fixed price subcontract. Construction will be performed by a fixed-price construction contractor administered by the ORNL operating contractor. Procurement of research capital equipment will be performed by the ORNL operating contractor. Project and construction management, inspection, coordination, utility tie-ins, testing and checkout witnessing, and acceptance will be performed by the ORNL operating contractor.

[a] The annual escalation rates are: FY 2002 – 2.6%, FY 2003 – 2.8%, FY 2004 – 2.8%, FY 2005 – 2.9% and FY 2006 – 2.9% as directed by DOE.

[b] Initial research equipment, including testing and acceptance.

## 6. Schedule of Project Funding

| | (dollars in thousands) | | | | | |
|---|---|---|---|---|---|---|
| | Prior Years | FY 2003 | FY 2004 | FY 2005 | Outyears | Total |
| Project Cost | | | | | | |
| Facility Cost | | | | | | |
| Design | 1,342 | 1,121 | 25 | 0 | 0 | 2,488 |
| Construction | 0 | 1,160 | 18,267 | 19,215 | 22,752 | 61,394 |
| Total, Line item TEC | 1,342 | 2,281 | 18,292 | 19,215 | 22,752 | 63,882 |
| Other project costs | | | | | | |
| Conceptual design costs | 150 | 0 | 0 | 0 | 0 | 150 |
| NEPA documentation Costs | 5 | 0 | 0 | 0 | 0 | 5 |
| Other project related Costs [a] | 320 | 100 | 250 | 100 | 75 | 845 |
| Total, Other Project Costs | 475 | 100 | 250 | 100 | 75 | 1,000 |
| Total, Project Cost (TPC) | 1,817 | 2,381 | 18,542 | 19,315 | 22,827 | 64,882 |

## 7. Related Annual Funding Requirements

| | (FY 2006 dollars in thousands) | |
|---|---|---|
| | Current Estimate | Previous Estimate |
| Annual facility operating costs | 18,000 | 18,000 |
| Total related annual funding | 18,000 | 18,000 |

[a] Experimental research will begin at the time of beneficial occupancy of the facility. These research costs are not part of the TPC and will be funded by BES.